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FOREST FIRE BURNING CONDITIONS IN THE LAKE STATES

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By John S. Crosby, Forester

INTRODUCTION

Both the occurrence and the behavior of forest fires differ as the severity of burning conditions change. So, to provide adequate protection at reasonable cost, efficient fire-protection agencies vary the intensity of organization. This is largely a matter of judgment. However, a guide to the intensity of organization required is provided by the Lake States Burning Index Meter, which has been in use since 1936 by the forest protection organizations in Michigan, Wisconsin, and Minnesota.

To learn more about fire occurrence and behavior under different burning conditions, 12 years' records from the eight national forest units of the Lake States were summarized. These records covered the period 1936 through 1947, during which the burning index meter was used. The results show the normal frequency and distribution of days in the various classes of burning conditions throughout the fire season, and the relative danger prevailing under different burning conditions.

WHAT THE BURNING INDEX METER IS

Since the study is based chiefly on readings of the burning index meter, a very brief description of it is desirable. The Lake States Burning Index Meter resulted from research designed to provide a measure of the severity of burning conditions. It is based upon the fact that the inflammability of fuels is in proportion to their moisture content. Meter values, in turn, are derived from the weather factors which influence fuel moisture, and which have been correlated with fuel moisture to give an index of burning conditions. The weather factors measured are amount of rainfall, number of days since last rain, relative humidity, and wind velocity.

The scale of the meter is calibrated 0 to 100. Zero represents poorest burning conditions, while 100 represents extreme burning conditions. The scale is divided into seven classes of burning conditions. These are: 0-1, safe; 2-3, very low; 4-6, low; 7-12, moderate; 13-24, high; 25-49, very high; and 50-100, extreme.

1/ Maintained at University Farm, St. Paul, Minnesota, in cooperation with the University of Minnesota.

Nearly every state protection district and national forest ranger district maintains at least one fire weather station where observations are normally made daily at 8:00 a.m., noon, and 5:00 p.m. during the fire season. Burning-index ratings are computed from these observations, and are assumed to be representative of the district.

HOW THE STUDY WAS MADE

The data used consists of burning index meter readings and records of number and size of fires for the same localities and periods. To obtain comparable values for different forests and years, certain arbitrary decisions had to be made as to season covered and method of classifying days.

Season Covered

The fire season in the Lake States varies in length and severity because of differences in the weather. In general it corresponds with the snow-free period, usually beginning in March and ending in November.

Fire weather reports and meter readings are required by the Forest Service from April 1 through October 31, though they are started earlier or continued later as snow conditions dictate. However, as comparable data are available only for the period April through October, March and November data were not included in the present analysis.

Method of Classifying Days

In this summary of national forest records, a burning-index rating for each forest was given to each day of the fire season corresponding to the maximum rating recorded at any of the several stations on the forest. The term "forest day" is used to identify this unit of time and area. In summarizing the data, each daily forest maximum meter reading from 0 to 100 was placed in the appropriate one of the seven groups, (0-1, 2-3, 4-6, 7-2, etc.) and all fires starting on a forest were classified according to the rating of the "forest day."

RESULTS

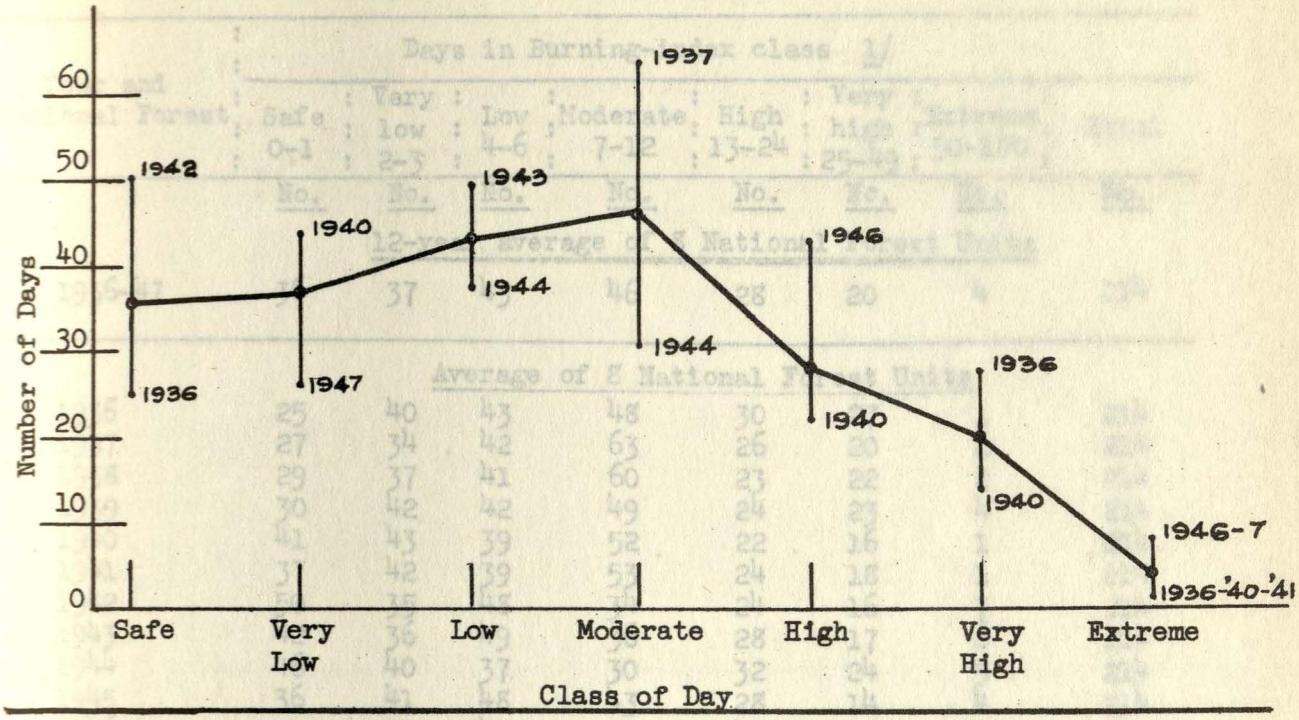
Frequency of Days in Each Burning Index Class by Years and Months

Since many decisions in regard to fire control are now based upon the burning-index class of day, it is important to know how many days normally fall in the different classes each month and year, and also the variation from normal (Tables 1 and 2, Charts 1 and 2).2/ As might be expected, there is considerable variation from month to month, year to year, and forest to forest. However, the 12-year averages for the period 1936-1947 appear quite stable, covering a good range of dry and wet seasons, and should, therefore, provide a reasonably accurate group of values.

2/ Annual figures for each forest are given in the appendix.

NUMBER OF DAYS IN EACH BURNING INDEX CLASS

Average of eight Lake States National Forests for a 12 year period (1936-1947), and range of variation between years.



Average of eight Lake States National Forests for a 12 year period (1936-1947), and range of variation between the 12-year averages for each individual National Forest.

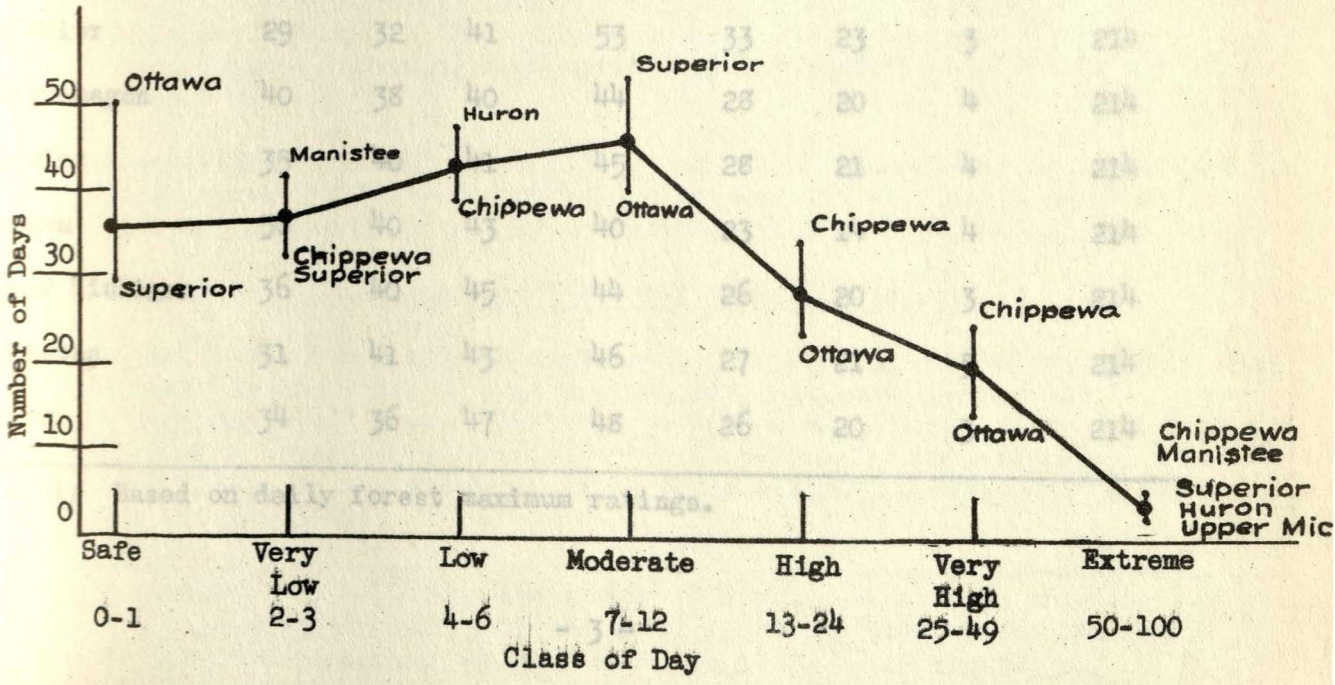


Chart 1

Table 1.- Average number of days in each burning-index class, April 1-October 31, 1936-47

Year and National Forest	Days in Burning-index class 1/							
	Safe 0-1	Very low 2-3	Low 4-6	Moderate 7-12	High 13-24	Very high 25-49	Extreme 50-100	Total
	No.	No.	No.	No.	No.	No.	No.	No.
12-year average of 8 National Forest Units								
1936-47	36	37	43	46	28	20	4	214
Average of 8 National Forest Units								
1936	25	40	43	48	30	27	1	214
1937	27	34	42	63	26	20	2	214
1938	29	37	41	60	23	22	2	214
1939	30	42	42	49	24	23	4	214
1940	41	43	39	52	22	16	1	214
1941	37	42	39	53	24	18	1	214
1942	50	35	48	34	24	16	7	214
1943	42	36	49	36	28	17	6	214
1944	46	40	37	30	32	24	5	214
1945	36	41	48	43	28	14	4	214
1946	29	31	40	38	42	26	8	214
1947	41	26	40	43	34	22	8	214
Forest Average for 12 Seasons								
Chippewa	34	32	39	46	34	24	5	214
Superior	29	32	41	53	33	23	3	214
Chequamegon	40	38	40	44	28	20	4	214
Nicolet	35	40	41	45	28	21	4	214
Ottawa	50	40	43	40	23	14	4	214
Upper Michigan	36	40	45	44	26	20	3	214
Manistee	31	41	43	46	27	21	5	214
Huron	34	36	47	48	26	20	3	214

1/ Based on daily forest maximum ratings.

Table 2.- Average number of days[1] in each burning-index class, by months (1936-1947)

Month	Days in Burning-index class							
	Safe 0-1	Very low 2-3	Low 4-6	Moderate 7-12	High 13-24	Very high 25-49	Extreme 50-100	Total
	No.	No.	No.	No.	No.	No.	No.	No.
	Average of 8 National Forests for 12 Years							
April	7	3	4	6	4	4	2	30
May	4	4	6	7	5	4	1	31
June	6	7	7	7	2	1	[2]/N	30
July	3	6	7	7	5	3	N	31
August	5	6	7	7	4	2	N	31
September	6	7	7	6	3	1	N	30
October	5	4	5	6	5	5	1	31
Total	36	37	43	46	28	20	4	214

1/ To nearest whole day.
2/ Less than 0.5 day.

Relative Severity

To simplify the comparison of areas or periods, a single figure, the relative severity,[3] has been used. This figure is essentially the percent of worst possible conditions, assuming that worst possible conditions would be met if all days were extreme.

On a 12-year basis the ratings provide a measure of the difference in burning conditions prevailing between months, and between forests, and a somewhat less important appraisal of yearly variation. (Tables 3, 4, and 5).

Evaluation of Burning Index Classes

To know the normal frequency and distribution of burning conditions is important only if there is knowledge of what a given burning-index class means in terms of fire occurrence and size. Burning conditions are determined by the weather, but fire danger depends upon several other factors. The more important of these are: risk, or the chance of fires being started, and hazard, or the character of the fuels.

3/ Obtained by weighting the number of days in each class and dividing the sum of the weighted values by the total number of days, times the weight given to the extreme class. Weights used are 1, 2, 4, 8, 16, 32, and 64 respectively per class.

NUMBER OF DAYS IN EACH BURNING INDEX CLASS BY MONTHS

Average of eight Lake States National Forests for a 12 year period (1936-1947)

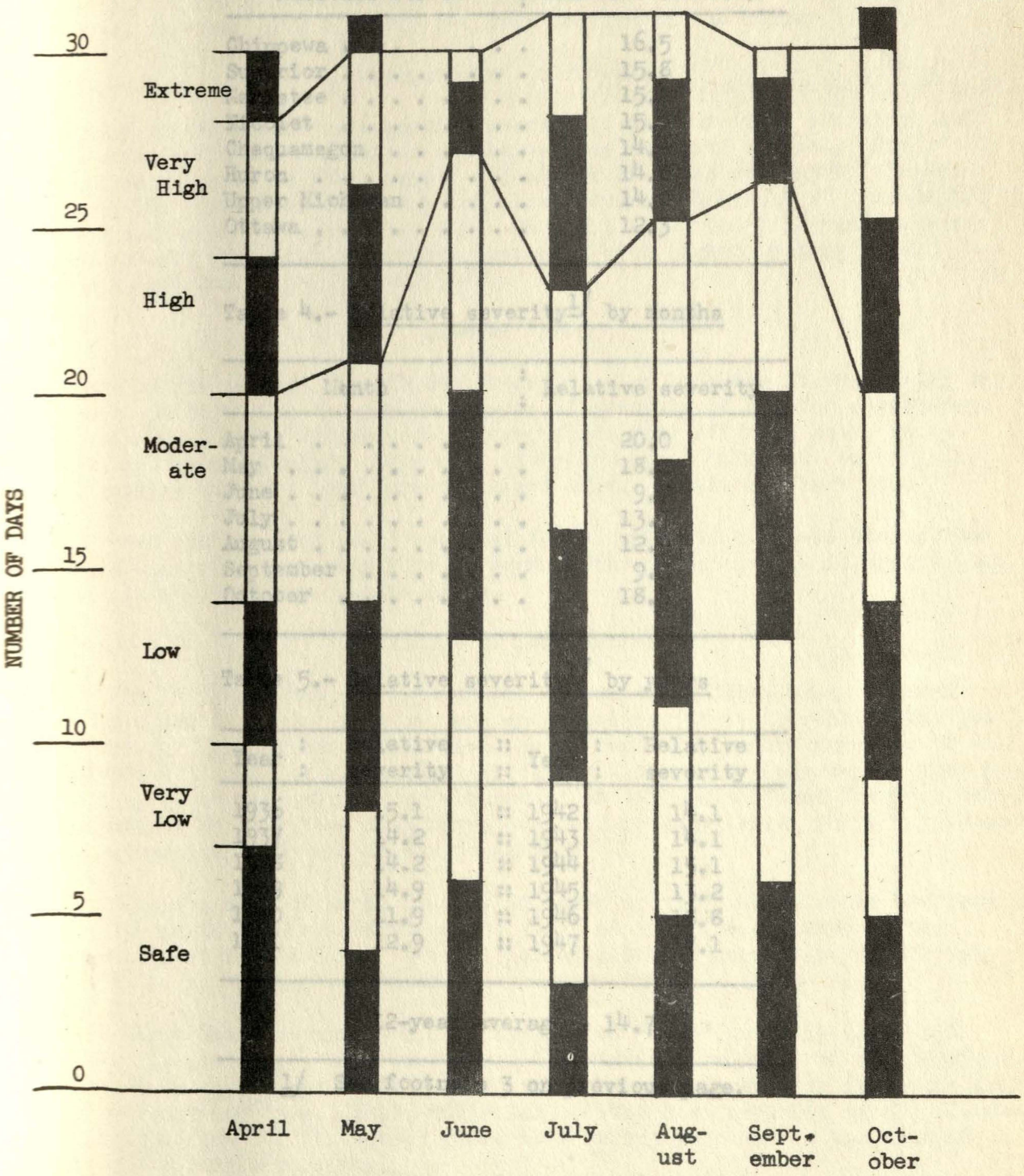


Chart 2

Table 3.- Relative severity[1/] by forests

National forest	Relative severity
Chippewa	16.5
Superior	15.8
Manistee	15.2
Nicolet	15.0
Chequamegon	14.4
Huron	14.2
Upper Michigan	14.0
Ottawa	12.3

Table 4.- Relative severity[1/] by months

Month	Relative severity
April	20.0
May	18.2
June	9.7
July	13.7
August	12.9
September	9.1
October	18.9

Table 5.- Relative severity[1/] by years

Year	Relative severity	Year	Relative severity
1936	15.1	1942	14.1
1937	14.2	1943	14.1
1938	14.2	1944	15.1
1939	14.9	1945	13.2
1940	11.9	1946	18.8
1941	12.9	1947	17.1

12-year average = 14.7

1/ See footnote 3 on previous page.

This complexity of factors contributing to number and size of fires makes impossible the accurate forecasting of fire-control requirements at the local level for a specific time. The trends produced over the 12-years, while an integration of all the factors, nevertheless indicate only the relative danger prevailing at the different burning-index levels. However, frequency and size of fires, together give a fairly reliable measure of the danger.

Frequency of Occurrence

Frequency of occurrence is a partial measure of risk of fires starting, and hence a factor in the evaluation of the various severity classes. Fire occurrence is shown in three ways: (1) number of fires per day by classes of days; (2) percent of days on which fires occurred (percent of fire days); and (3) number of fires per fire day. Upon all three bases 12-year averages of all forests show that occurrence increases with higher burning index (Table 6, and Charts 3a, 3b, and 3c).

Size of Fires

The size of the average fire in each class is also a factor in evaluating the danger associated with the various degrees of severity of burning conditions. As burning conditions become more severe, fires give off more heat, burn deeper, and spread faster. They are, therefore, more difficult to control, and according to these data, are of larger size. (Table 6, Chart 3d).

The 12-year records from the 8 national forest units in the Lake States show that the size of the average fire in each of the seven classes is approximately doubled in the next more severe class.

Influence of Large Fires

During the 12 years studied, 1.5 percent of the 4,909 fires that occurred were 100 acres or larger in size, and accounted for three-fourths of the total area burned. These fires alone raise the average area burned per fire of all fires from 4.3 acres to 17.8 acres per fire. While these figures are somewhat startling, it is not unusual for the record of well-established fire-protection organizations to show that most fires are held to small size, while infrequent fires become large for one reason or another.

An analysis was made of large fires (100 acres or more) which could be clearly classified as to burning conditions at start of the fire as taken at the station nearest to the fire. This illustrated the tendency toward more and larger fires as burning conditions became more severe. (Table 7).

None of these fires occurred on days classified "safe" or "very low," and only one fire occurred on a "low" day. The highest frequency of the remainder fell on "very high" days. The average size of large fires also increases from "low" to "extreme" days. Thus, while large fires have occurred on all classes of days from "low" to "extreme," there is a marked increase in the size of fires on the more severe days.

Table 6.- Evaluation of Burning Index Classes

Burning index classes	Average per forest 1/								12-year total all forests		
	Days in class per year	Days having one or more fires per year		Number of fires			Area burned		Large fires (100 acres or more) 3/		
				per day	per fire day 2/	Per year	Per fire	Per year	Total 4/ 12-years	Area burned Total 12-years	Area burned Per fire
	Number	Number	Percent	Number	Number	Number	Acres	Acres	Number	Acres	Acres
Safe 0-1	36	.8	2.3	.03	1.17	1.0	.6	.6	0	0	0
Very low 2-3	37	1.6	4.3	.05	1.19	1.9	2.3	4.2	0	0	0
Low 4-6	43	3.6	8.5	.11	1.28	4.6	2.8	13.0	1	122	122
Moderate 7-12	46	8.1	17.6	.25	1.42	11.5	4.0	45.4	15	2,954	197
High 13-24 ...	28	7.5	26.6	.41	1.56	11.6	10.4	121.0	17	9,268	545
Very high 25-49 ...	20	8.2	40.6	.74	1.82	15.0	29.9	449.0	22	13,180	599
Extreme 50-100 ..	4	2.3	56.7	1.34	2.37	5.5	50.8	279.8	12	19,249	1,604
Total or average	214	32.1	15.0	.24	1.59	51.1	17.8	913.0	67	44,773	668

1/ Averages based on 8 national forest units, for the periods April through October for 12-years 1936-1947, using Daily Forest Maximum Burning Index Ratings.

2/ A fire day is a day on which one or more fires occurred on a forest.

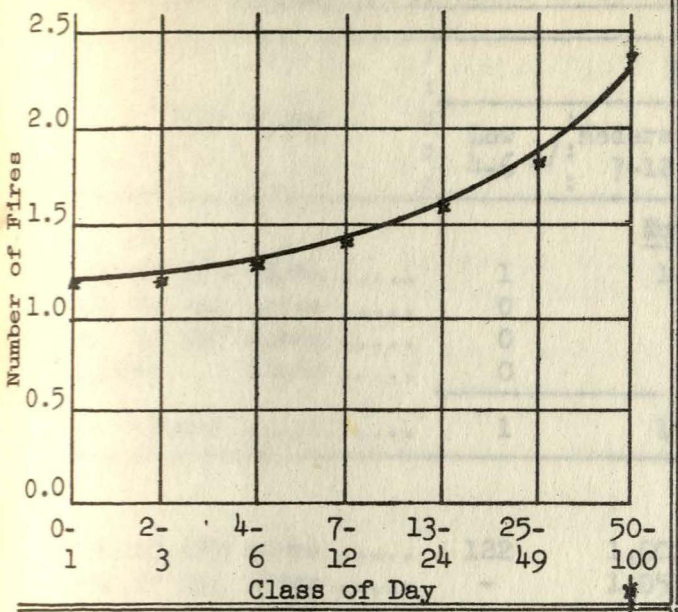
3/ Classification based on Maximum Burning Index recorded at Station nearest to fire on day of origin.

4/ March and November fires and 5 other fires not subject to classification are not included.

3a

NUMBER OF FIRES PER FIRE DAY

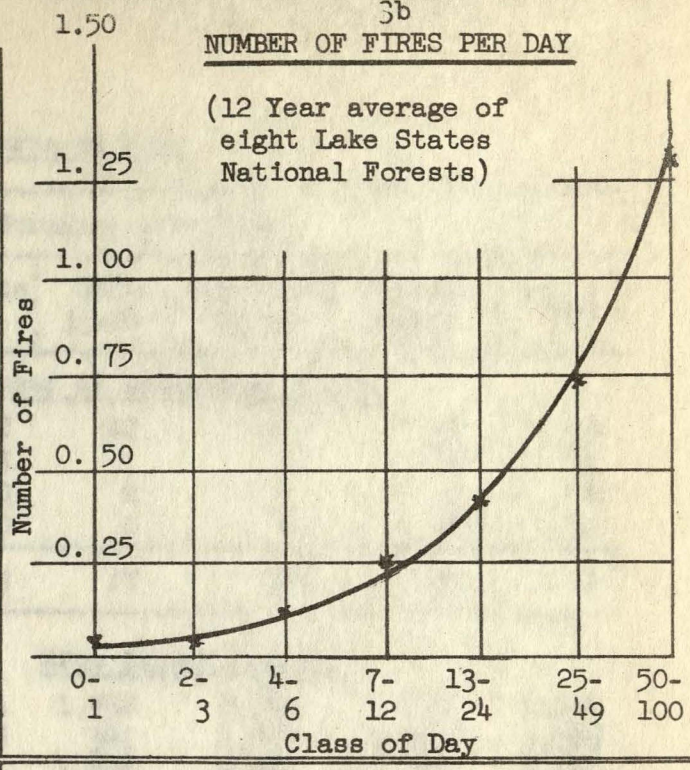
(12 Year average of eight Lake States National Forests)



3b

NUMBER OF FIRES PER DAY

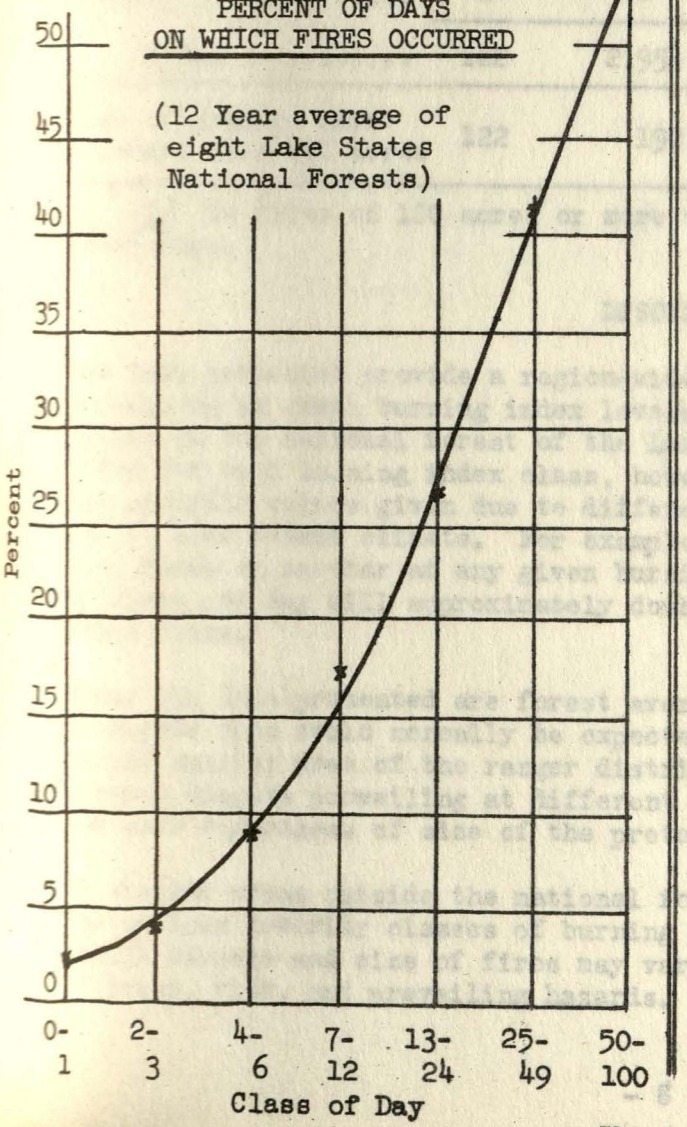
(12 Year average of eight Lake States National Forests)



3c

PERCENT OF DAYS ON WHICH FIRES OCCURRED

(12 Year average of eight Lake States National Forests)



3d

SIZE OF AVERAGE FIRE

(12 Year average of eight Lake States National Forests)

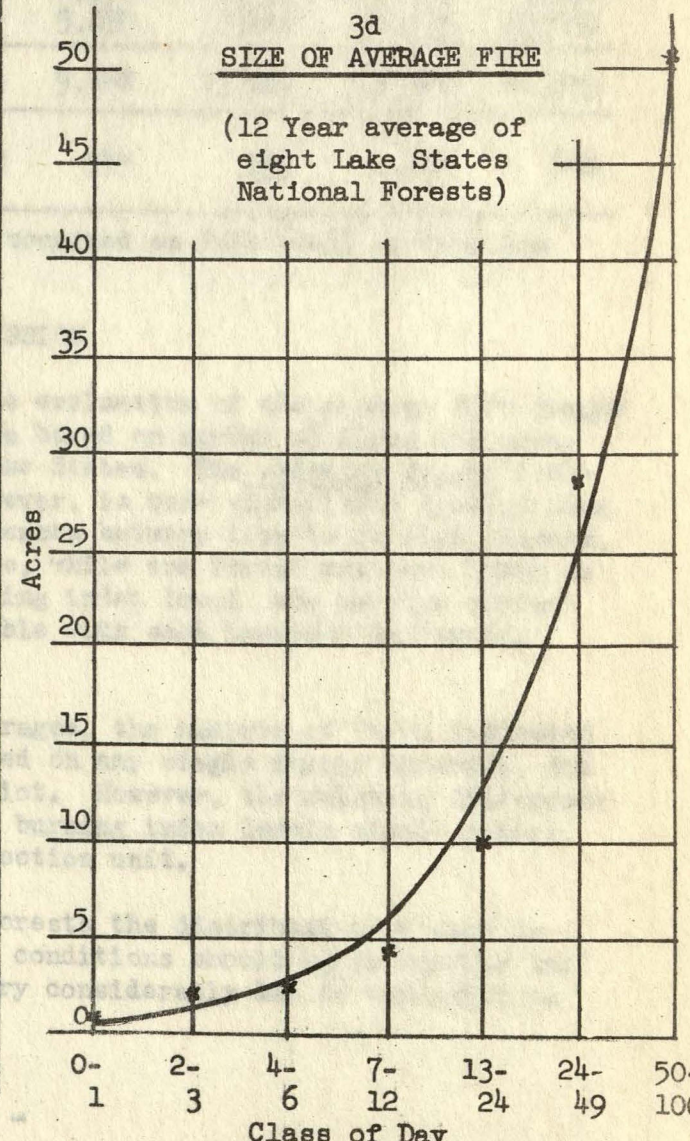


Chart 3

Table 7.- Summary of 67 fires of 100 acres or more

Size class	Burning-index class					
	Low 4-6 1/	Moderate 7-12	High 13-24	Very high 25-49	Extreme 50-100	Total
	Number of individual fires					
100 to 299 acres	1	12	12	12	2	39
300 to 499 acres	0	3	1	3	4	11
500 to 999 acres	0	0	2	3	1	6
1,000+ acres	0	0	2	4	5	11
Total	1	15	17	22	12	67
	Area burned (acres)					
100 to 299 acres	122	1,901	1,952	2,042	218	6,235
300 to 499 acres	-	1,053	341	1,045	1,517	3,956
500 to 999 acres	-	-	1,936	2,483	742	5,161
1,000+ acres	-	-	5,039	7,610	16,772	29,421
Total	122	2,954	9,268	13,180	19,249	44,773
Size of average fire larger than 100 acres	122	197	545	599	1,604	668

1/ No fires of 100 acres or more occurred on Safe (0-1) or Very low (2-3) days.

DISCUSSION

The data presented provide a region-wide evaluation of the average fire danger prevailing at given burning index levels based on number of fires and area burned on the national forest of the Lake States. The relative danger indicated for each burning index class, however, is more significant locally than the specific values given due to differences between forests in risk, hazard, and to some extent climate. For example, while one forest may have twice as many fires as another at any given burning index level, the average number of fires per day will approximately double with each increase in burning index class.

Since the data presented are forest averages, the numbers of fires indicated is higher than could normally be expected on any single ranger district, due to the smaller area of the ranger district. However, the relative difference between dangers prevailing at different burning index levels should remain the same regardless of size of the protection unit.

On similar areas outside the national forests the distribution of days in the various severity classes of burning conditions should apply equally well, though numbers and size of fires may vary considerably due to variation in policies, risk, and prevailing hazards.

SUMMARY

Results of the analysis 4/ of forest fire records of the national forests of the Lake States for the period 1936 through 1947 show that as burning conditions become more severe, fire danger likewise becomes more severe. Thus:

1. The number of fires per day is approximately doubled with each increase to a more severe class of day.

2. The size of an average fire is approximately doubled for each increase of burning conditions to a more severe class of day.

No fire of 100 acres or more occurred when the burning index was "safe" or "very low." One large fire out of 67 occurred on a "low" day, while all the others occurred on moderate or more severe days, and as the burning conditions became more severe these fires were found to be larger.

4/ Table 6 summarizes the results of the analysis.

* * * * * * * * *

APPENDIX

The following tables give specific data for each national forest. Separate tables are given for the Manistee and Huron units of the lower Michigan National Forest, since the records were started separately before the two units were consolidated.

EVALUATION OF BURNING INDEX CLASSES
CHIPPEWA NATIONAL FOREST
Period: April through October, 1936-1947
Basis: 2568 Forest Days, 559 Fires, 6000.5 Acres Burned

Year	Burning index class of day								
	Safe 0-1	Very low 2-3	Low 4-6	Moderate 7-12	High 13-24	Very high 25-49	Extreme 50-100	Total	Relative severity 1/
	Number of days in burning index class								
1936	19	39	31	48	39	37	1	214	18.1
1937	19	28	39	71	32	20	5	214	16.6
1938	18	29	43	59	28	36	1	214	17.4
1939	16	39	40	42	31	40	6	214	20.1
1940	23	32	27	65	35	29	3	214	17.5
1941	42	42	31	46	40	12	1	214	12.5
1942	47	28	47	36	22	23	11	214	17.3
1943	38	24	49	33	39	22	9	214	17.9
1944	57	35	32	39	26	15	10	214	15.4
1945	49	22	43	45	35	14	6	214	14.7
1946	34	33	48	35	40	17	7	214	16.1
1947	44	31	42	32	41	22	2	214	14.7
12-year average	34	32	39	46	34	24	5	214	16.5

12-year average of:	Average per year							All Classes
Days having fires Percent	.3	1.3	3.2	7.3	19.4	36.6	62.9	11.1
Days having fires Number	1.0	1.0	1.0	3.0	7.0	9.0	3.0	24.0
Fires per day Number	.001	.02	.03	.08	.29	.78	2.37	.22
Fires per fire day Number	1.1	1.2	1.1	1.2	1.5	2.1	3.8	2.0
Fires per year Number	2/ N	1.0	1.0	4.0	10.0	19.0	12.0	47.0
Size of fire Acres	N	6.0	5.7	3.9	8.9	6.7	22.9	10.8
Area burned Acres	N	3.0	7.6	15.1	89.2	105.8	280.1	500.8
Total burn in class Percent	0	.6	1.5	3.0	17.8	21.1	56.0	100.0

1/ Relative severity of fire season.
2/ Negligible amount.

EVALUATION OF BURNING INDEX CLASSES
SUPERIOR NATIONAL FOREST
Period: April through October, 1936-1947
Basis: 2568 Forest Days, 609 Fires, 28,337.2 Acres Burned

Year	Burning index class of day								
	Safe 0-1	Very low 2-3	Low 4-6	Moderate 7-12	High 13-24	Very high 25-49	Extreme 50-100	Total	Relative severity 1/
	Number of days in burning index class								
1936	20	22	37	67	41	26	1	214	16.8
1937	26	31	41	68	31	15	2	214	13.9
1938	15	27	43	74	24	29	2	214	16.6
1939	29	37	39	55	26	25	3	214	15.3
1940	19	37	33	74	34	17	0	214	13.9
1941	41	49	40	46	16	21	1	214	12.1
1942	38	32	44	43	32	20	5	214	15.3
1943	32	27	43	53	30	24	5	214	16.4
1944	44	32	45	33	26	29	5	214	16.2
1945	23	39	44	47	36	22	3	214	15.5
1946	28	26	34	39	55	24	8	214	19.6
1947	36	19	48	43	40	21	7	214	17.3
12-year average	29	32	41	53	33	23	3	214	15.8

12-Year average of:	Average per year							All Classes
Days having fires Percent	2.3	4.3	8.5	17.6	26.6	40.6	56.7	15.0
Days having fires Number	1.0	2.0	4.0	8.0	8.0	8.0	2.0	33.0
Fires per day Number	.05	.07	.13	.22	.39	.63	.76	.23
Fires per fire day Number	1.2	1.2	1.3	1.3	1.6	1.6	1.5	1.6
Fires per year Number	2.0	2.0	5.0	12.0	13.0	14.0	2.7	50.7
Size of fire Acres	2/ N	.2	1.7	4.1	6.3	152.0	7.7	46.5
Area burned Acres	N	.4	9.1	48.8	79.1	2203.4	20.6	2361.4
Total burn in class Percent	N	N	1.7	9.3	14.9	70.2	3.9	100.0

1/ Relative severity of fire season.
2/ Negligible amount.

EVALUATION OF BURNING INDEX CLASSES
CHEQUAMEGON NATIONAL FOREST
Period: April through October, 1936-1947
Basis: 2568 Forest Days, 263 Fires, 2110 Acres Burned

Year	Burning index class of day								
	Safe 0-1	Very low 2-3	Low 4-6	Mod-erate 7-12	High 13-24	Very high 25-49	Ex-treme 50-100	Total	Relative severity 1/
	Number of days in burning index class								
1936	11	23	40	55	55	29	0	214	18.0
1937	22	30	48	58	20	35	1	214	16.4
1938	28	40	37	56	22	29	2	214	15.4
1939	34	44	46	44	18	19	9	214	15.6
1940	36	46	42	45	18	25	2	214	13.7
1941	23	43	43	59	28	18	0	214	13.0
1942	65	39	38	29	21	15	7	214	13.1
1943	61	38	39	29	28	13	6	214	12.9
1944	54	46	39	27	29	18	1	214	11.8
1945	58	38	39	39	24	9	7	214	12.6
1946	38	37	33	56	37	19	4	214	15.1
1947	48	31	37	44	34	13	7	214	14.7
12-year average	40	38	40	44	28	20	4	214	14.4

12-Year average of:	Average per year							All Classes
Days having fires Percent	1.5	2.6	5.4	8.1	13.5	24.4	41.3	8.2
Days having fires Number	.6	1.0	2.2	3.6	3.7	4.9	1.6	17.6
Fires per day Number	.01	.03	.06	.09	.17	.35	.54	.10
Fires per fire day Number	1.00	1.00	1.19	1.07	1.27	1.44	1.32	1.25
Fires per year Number	.6	1.0	2.6	3.8	4.7	7.1	2.1	21.9
Size of average fire Acres	.1	5.4	1.4	3.5	2.9	17.6	6.9	8.0
Area burned per year Acres	2/ N	5.4	3.6	13.6	13.9	125.0	14.3	175.8

1/ Relative severity of fire season.
2/ Negligible amount.

EVALUATION OF BURNING INDEX CLASSES
NICOLET NATIONAL FOREST
Period: April through October, 1936-1947
Basis: 2568 Forest Days, 263 Fires, 2110 Acres Burned

Year	Burning index class of day								
	Safe 0-1	Very low 2-3	Low 4-6	Moderate 7-12	High 13-24	Very high 25-49	Extreme 50-100	Total	Relative severity 1/
	Number of days in burning index class								
1936	23	37	46	53	31	22	2	214	14.8
1937	15	27	44	66	36	24	2	214	16.4
1938	37	42	40	57	23	11	4	214	12.5
1939	26	46	32	59	22	26	3	214	15.3
1940	55	48	36	45	13	14	3	214	11.1
1941	47	46	38	50	19	14	0	214	10.5
1942	42	39	49	38	19	20	7	214	14.7
1943	31	43	53	35	33	13	6	214	14.1
1944	40	41	34	22	39	33	5	214	17.8
1945	33	40	51	42	21	18	9	214	15.6
1946	25	39	29	29	51	36	5	214	20.0
1947	42	28	36	44	34	21	9	214	17.4
12-year average	35	40	41	45	28	21	4	214	15.0

12-Year average of:	Average per year							All Classes
Days having fires Percent	2.6	4.2	10.9	22.4	28.4	43.6	58.2	17.3
Days having fires Number	.9	1.7	4.4	10.0	8.1	9.2	2.7	37.0
Fires per day Number	.04	.06	.14	.32	.41	.88	1.16	.28
Fires per fire day Number	1.4	1.4	1.3	1.4	1.4	2.0	2.0	1.6
Fires per year Number	1.3	2.3	5.7	14.5	11.8	18.6	5.3	59.5
Size of average fire Acres	1.7	.9	.8	3.2	4.8	6.7	15.5	5.4
Area burned per year Acres	2.3	2.1	4.5	47.0	56.7	124.2	82.6	319.4

1/ Relative severity of fire season.

EVALUATION OF BURNING INDEX CLASSES
OTTAWA NATIONAL FOREST
Period: April through October, 1936-1947
Basis: 2568 Forest Days, 375 Fires, 3980 Acres Burned

Year	Burning index class of day								
	Safe 0-1	Very low 2-3	Low 4-6	Moderate 7-12	High 13-24	Very high 25-49	Extreme 50-100	Total	Relative severity 1/
	Number of days in burning index class								
1936	38	44	57	40	20	15	0	214	10.8
1937	42	35	33	66	26	11	1	214	11.7
1938	53	43	44	46	14	13	1	214	10.1
1939	58	39	38	34	29	13	3	214	11.9
1940	69	49	36	42	11	6	1	214	7.9
1941	44	41	44	55	20	10	0	214	10.1
1942	63	38	52	24	18	14	5	214	11.6
1943	58	42	51	26	22	11	4	214	11.1
1944	47	44	39	31	31	18	4	214	13.6
1945	41	43	51	34	27	15	3	214	12.5
1946	31	39	44	35	26	29	10	214	18.6
1947	59	22	30	41	34	16	12	214	17.3
12-year average	50	40	43	40	23	14	4	214	12.3

12-Year average of:	Averages per year							All Classes
Days having fires Percent	3.0	4.0	6.4	17.1	28.1	36.8	54.5	12.3
Days having fires Number	1.5	1.6	2.8	6.8	6.5	5.2	2.0	26.4
Fires per day Number	.04	.05	.07	.23	.39	.51	.95	.17
Fires per fire day Number	1.2	1.3	1.2	1.3	1.4	1.4	1.8	1.4
Fires per year Number	1.8	2.0	3.2	9.0	9.1	7.2	3.5	35.8
Size of fire Acres	.5	1.8	2.4	4.6	7.4	3.6	69.1	10.8
Area burned Acres	.8	.4	7.6	41.6	67.2	26.4	241.9	385.9

1/ Relative severity of fire season.

EVALUATION OF BURNING INDEX CLASSES
UPPER MICHIGAN NATIONAL FOREST
Period: April through October, 1936-1947
Basis: 2568 Forest Days, 734 Fires, 9833 Acres Burned

Year	Burning index class of day								
	Safe 0-1	Very low 2-3	Low 4-6	Mod-erate 7-12	High 13-24	Very high 25-49	Ex-treme 50-100	Total	Relative severity 1/
	Number of days in burning index class								
1936	27	68	40	44	19	16	0	214	10.9
1937	26	32	48	57	22	27	2	214	15.2
1938	39	44	43	54	21	11	2	214	11.3
1939	36	47	50	43	16	21	1	214	12.2
1940	49	43	51	44	18	9	0	214	9.2
1941	40	50	30	61	15	17	1	214	16.0
1942	57	30	48	32	27	14	6	214	13.4
1943	49	33	55	32	18	23	4	214	13.7
1944	33	37	32	27	44	29	12	214	20.8
1945	24	47	56	35	35	14	3	214	13.3
1946	16	26	45	49	41	33	4	214	19.0
1947	31	22	42	52	35	26	6	214	17.8
12-year average	36	40	45	44	26	20	3	214	14.0

12-Year average of:	Average per year							All Classes
Days having fires Percent	3.3	5.4	11.3	24.9	35.4	48.3	61.0	18.8
Days having fires Number	1.1	2.2	5.1	11.0	9.1	9.7	2.1	40.3
Fires per day Number	.04	.06	.14	.37	.50	.86	1.32	.29
Fires per fire day Number	1.2	1.2	1.2	1.5	1.4	1.8	2.2	1.5
Fires per year Number	1.3	2.5	6.3	16.4	12.8	17.3	4.5	61.1
Size of fire Acres	.1	3.0	2.6	3.2	25.8	27.9	13.3	15.5
Area burned Acres	.1	7.5	16.5	52.3	330.5	480.8	60.0	947.7

1/ Relative severity of fire season.

EVALUATION OF BURNING INDEX CLASSES
MANISTEE NATIONAL FOREST
Period: April through October 1936-1947
Basis: 2,568 Forest Days, 1,309 Fires, 7,179 Acres Burned

Year	Burning index class of day								
	Safe 0-1	Very low 2-3	Low 4-6	Moderate 7-12	High 13-24	Very high 25-49	Extreme 50-100	Total	Relative severity 1/
	Number of days in burning index class								
1936	28	48	51	35	20	32	0	214	14.3
1937	38	51	37	54	22	10	2	214	11.1
1938	17	39	39	65	30	19	5	214	15.9
1939	21	46	37	59	27	22	2	214	14.6
1940	39	44	42	52	22	15	0	214	11.3
1941	28	31	38	56	30	28	3	214	16.5
1942	45	35	56	36	25	12	5	214	12.6
1943	27	40	54	41	30	14	8	214	15.3
1944	43	40	35	29	34	30	3	214	16.0
1945	32	53	43	51	22	11	2	214	11.3
1946	29	27	43	29	42	26	18	214	22.9
1947	29	34	44	44	19	30	14	214	20.3
12-year average	31	41	43	46	27	21	5	214	15.2

12-Year average of:	Average per year							All Classes
Days having fires Percent	2.7	7.8	16.4	32.8	48.6	66.3	85.5	26.8
Days having fires Number	.8	3.2	7.1	15.1	13.1	13.7	4.4	57.4
Fires per day Number	.03	.09	.23	.57	.97	1.44	2.37	.51
Fires per fire day Number	1.0	1.2	1.4	1.7	2.0	2.2	2.8	1.9
Fires per year Number	.8	3.7	10.0	26.2	26.2	30.0	12.2	109.1
Size of fire Acres	1.3	3.1	2.4	3.7	6.2	6.5	8.7	5.5
Area burned Acres	1.1	11.3	24.6	97.8	163.0	193.7	106.7	598.2

1/ Relative severity of fire season.

EVALUATION OF BURNING INDEX CLASSES
HURON NATIONAL FOREST
Period: April through October 1936-1947
Basis: 2,568 Forest Days, 294 Fires, 22,652 Acres Burned

Year	Burning index class of day								
	Safe 0-1	Very low 2-3	Low 4-6	Moderate 7-12	High 13-24	Very high 25-49	Extreme 50-100	Total	Relative severity 1/
	Number of days in burning index class								
1936	37	38	46	38	18	36	1	214	15.4
1937	29	35	44	66	23	15	2	214	13.0
1938	23	29	44	67	26	24	1	214	14.9
1939	22	37	54	58	24	16	3	214	13.6
1940	35	43	46	51	22	16	1	214	12.0
1941	31	31	48	54	22	25	3	214	15.1
1942	44	38	49	38	25	12	8	214	14.0
1943	42	43	46	39	24	15	5	214	13.2
1944	47	45	41	36	28	17	0	214	11.5
1945	30	44	61	48	21	7	3	214	10.9
1946	31	23	44	42	39	26	9	214	19.1
1947	39	21	41	45	37	26	5	214	17.2
12-year average	34	36	47	48	26	20	3	214	14.2

12-Year average of:	Average per year							All Classes
Days having fires Percent	1.0	1.9	5.0	11.2	18.4	27.6	24.4	9.2
Days having fires Number	.3	.7	.3	5.4	4.8	5.4	.8	19.7
Fires per day Number	.01	.02	.06	.13	.22	.36	.44	.11
Fires per fire day Number	1.0	1.1	1.2	1.2	1.2	1.3	1.8	1.2
Fires per year Number	.3	.8	2.9	6.4	5.6	7.0	1.5	24.5
Size of fire Acres	1.5	5.2	10.4	7.4	30.1	29.3	954.9	77.0
Areas burned Acres	.5	3.9	30.4	47.4	168.3	204.9	1432.3	1887.7

1/ Relative severity of fire season.